LII.—*On* Amphipleura pellucida *and* Surirella gemma *as Test-objects.* By J. J. Woodward, Assistant Surgeon, U. S. Army*.

The attention of microscopists has frequently been directed, of late years, to the *Amphipleura pellucida* or *Navicula acus* as a test-object well suited to try the defining-powers of the very best object-glasses. The length of this diatom is stated by Pritchard as ranging from $\frac{1}{14\,0}$ to $\frac{1}{30\,0}$ of an inch. The average length is given in the 'Micrographic Dictionary' at ·0044 of an inch. The striæ, which are exceedingly difficult, were first described by Messrs. Sollitt and Harrison, who estimated them at from 120,000 to 130,000 to the inch. Their estimate has been adopted in the 'Micrographic Dictionary' and by the majority of modern writers who have referred to this test; but so many difficulties beset the resolution, that few microscopists appear to have attempted to verify the original estimates. Indeed most observers would seem to have been unsuccessful in their efforts to resolve the *Amphipleura* even with the best objectives; and some have gone so far as to deny the existence of any striæ upon the frustules of this species.

Among the microscopists who claim to have seen the striæ, several would seem to differ from the original estimates of Sollitt and Harrison as to their fineness. Dr. Royston-Pigott, whose papers on "high-power definition," in the 'Monthly Microscopical Journal,' have recently attracted much attention, sets down their number at 150,000 to the inch. Dr. Carpenter, on the other hand, in the 4th edition of 'The Microscope and its Revelations,' expresses the opinion that even the estimates of Messrs. Sollitt and Harrison are too high; and we are told by Mr. Lobb (Monthly Microscopical Journal, vol. iii. p. 104) that Mr. Lealand has recently "succeeded in counting the *Amphipleura*-lines, and finds them 100 in $\frac{1}{10\,0\,0}$ of an inch."

A few months ago two slides of *Amphipleura pellucida* were received at the Army Medical Museum from Messrs. Powell and Lealand, and I succeeded in obtaining excellent resolution by the immersion $\frac{1}{16}$ of these makers. The frustules on the two slides were found to measure from $\frac{1}{17\,0}$ to $\frac{1}{40\,0}$ of an inch in length. Resolution could be satisfactorily effected and the striæ counted on any of them. I took eight successful negatives from medium-sized and small frustules, and verified the counts made in the microscope by counting the striæ on the glass negatives. I found the striæ on medium-sized frustules, say $\frac{1}{20\,0}$ of an inch in length, counted usually from 90 to 93 striæ to the $\frac{1}{10\,0\,0}$ of an inch; in that selected for the two photographs

* From 'Silliman's American Journal,' May 1871.

which accompany this memorandum the number was 91 to the $\frac{1}{1000}$ of an inch. Larger frustules exhibited rather coarser, smaller ones rather finer striæ. On the smallest frustules at my disposal (several of them only $\frac{1}{400}$ inch in length) I found no example in which the number of striæ exceeded 100 to the $\frac{1}{1000}$ of an inch. The striæ of these smallest and most difficult frustules do not, then, rival in fineness the nineteenth band of the Nobert's plate, as has been asserted by some; they compare rather with the sixteenth and seventeenth bands.

After making the photographs, I extended my observations to a number of other slides of *Amphipleura pellucida*—including two of the original specimens from Hull, kindly sent to the museum some time since by Mr. W. S. Sullivant, of Columbus, Ohio, and the example in the First Century of Eulenstein. I found that different slides varied considerably in the ease with which I could resolve them, chiefly, as I think, on account of the thickness of the glass covers, which in several instances did not permit the best work of the immersion $\frac{1}{16}$. Perhaps, however, the markings on some frustules may be shallower than on others whose striæ count the same number to the $\frac{1}{1000}$ of an inch. In any event, I have found, as yet, no slides the covers of which permit the $\frac{1}{16}$ to be approximately adjusted, on which it was impossible to resolve the frustules, and no frustules the striæ of which exceeded 100 to the $\frac{1}{1000}$ of an inch.

The best resolution I was able to obtain by ordinary lamplight was not very satisfactory. I used, therefore, during the investigation, direct sunlight rendered monochromatic by passage through the solution of ammonio-sulphate of copper. A parallel pencil of such light was concentrated by the achromatic condenser, which was suitably decentred to obtain obliquity. The same illumination was employed in making the photographs. I have since had the pleasure of exhibiting the resolution in quite as satisfactory a manner to several microscopists by monochromatic light obtained from the electric lamp.

The *Surirella gemma* has been recommended by Hartnack as a test for immersion-objectives of high powers. I have not gained access to his original description, but find accounts of his views, with figures, in the works of Drs. Carpenter and Frey (The Microscope and its Revelations, 4th ed. p. 182; Das Mikroskop, 3rd ed. p. 40). Hartnack observed fine longitudinal striæ in addition to the fine transverse ones previously known to exist between the large transverse ribs; he supposed the true markings to have the form of elongated hexagons.

Two handsome slides of this diatom were received at the

Army Medical Museum, a few months since, from Bourgogne of Paris. A careful study of these by monochromatic sunlight inclines me to the opinion that Hartnack's interpretation is erroneous, and that the fine striæ are in reality rows of minute hemispherical bosses, from which, as in the case of other diatoms, the appearance of hexagons would readily result if the frustule was observed by an objective of inferior defining-power to that I used, or if the illumination was unsuitable. This memorandum is accompanied by two photographs exhibiting what I saw; one is magnified 1034, the other 3100 diameters. The principal frustule shown in these photographs is $\frac{1}{290}$ of an inch in length (the mean length of *S. gemma* is stated in the 'Micrographic Dictionary' as $\frac{1}{240}$ of an inch). The fine transverse striæ counted longitudinally at the rate of 72 to the $\frac{1}{1000}$ of an inch. Transversely these were resolved into beaded appearances which counted laterally 84 to the $\frac{1}{1000}$ of an inch. If the structure consists, as I suppose it does, of fine hemispherical bosses projecting from the surface of the frustules, the fact that these bosses are set together more closely in the transverse direction than in the longitudinal would account for the elongated form of the pseudohexagons when seen.

Some parts of the photographs closely approach Hartnack's description, but it is easy to observe that these are not the parts which are most nearly in focus.

I have also resolved this diatom by monochromatic light derived from the electric lamp. The appearances obtained were identical with those above described.

LIII. — *Notices of British Fungi.* By the Rev. M. J. Berkeley, M.A., F.L.S., and C. E. Broome, Esq., F.L.S.

[Continued from vol. vi. p. 469.]

[Plates XVIII., XIX., XX., & XXI.]

**Coprinus fuscescens*, Fr. Ep. 244.

This species, introduced on the authority of a drawing by Lady Orde, has been found lately at Walthamstow.

1263. *Cortinarius* (Phlegmacium) *triumphans*, Fr. Ep. p. 256.

C. sublanatus, Hussey, seems to be a form of this species.

1264. *C.* (Phlegmacium) *russus*, Fr. Ep. p. 261; Trans. Woolh. Cl. 1870, t. 1.

In moist woods, W. G. Smith.